

book to be the outcome of a course of lectures to graduates intending to enter the teaching profession, in which Prof. Weber brings his long years' experience and profound knowledge to bear upon some of the subjects usually regarded as "elementary."

The first volume contains three parts, *Grundlagen der Arithmetik, Algebra, Analysis*. The remaining two volumes are to deal with geometry, and applications. The contents are what every teacher of elementary mathematics should know and not teach. The authors have found some difficulty in defining the range of subjects of discussion, but no limitation has been imposed upon the methods employed. The first few pages deal with aggregates, and later we come to the logical reasoning upon which the introduction of irrationals and of imaginaries is based. The part on algebra is chiefly concerned with theory of equations and theory of numbers, and the third part with infinite series and products, including the most important examples. Speaking generally, subjects of technical or practical interest are excluded, and only those presenting serious logical difficulties are discussed in detail.

The book is admirably printed and clearly arranged, and should prove a very useful and trustworthy companion to all who care for exact knowledge for its own sake.

R. W. H. T. H.

OUR BOOK SHELF.

Stars and Sextants. By Sprigge, Doak, Hudson and Cox. With an introduction by Lord Ellenborough. Pp. xxv+55. (London: J. D. Potter, 1903.) Price 2s. 6d.

THIS book places in the hands of explorers, navigators, surveyors and others who use the sextant a simple means of finding its centring error. The centring error of a sextant at sea has hitherto been severely left alone on account of the somewhat tedious calculations necessary to find it.

The method of obtaining the total error (and hence the centring error by applying the index error) by observing the distance between two stars when on the same vertical circle is mentioned in "Hydrographical Surveying," by Sir William J. L. Wharton, in the second edition, 1898. The error thus obtained is owing to refraction not strictly accurate, unless the two stars are of equal altitudes at the time of observing. The best time for observing the distance between two stars, so that refraction may have the least possible effect and alter slowest with the time, is when the altitudes of the stars are equal. However, the error due to refraction in observing stars at different altitudes is not great when they are on the same vertical circle, and in finding the error of a sextant at sea it may be neglected, especially if the altitude of the lower star be above 30 degrees.

The centring error can only be found for different points on the arc of a sextant by taking a large number of observations for each point and meaning the results. It is to be hoped this book will induce many to take these observations, so that while learning the principal stars they may also become expert observers.

The book contains (1) ephemeris, 1904, with star pairs of nearly equal magnitude; (2) distances of star pairs; (3) ex-meridian star pairs, with distances for every ten days; (4) semi-diurnal arcs for finding the

time a fictitious star rises and sets; (5) astronomical refraction corrected for barometer and thermometer; (6) notes on the stars. The descriptions and rules for using the tables are clear and simple, the figures are well arranged, and the type is very distinct. The temperature required for correcting the refraction should be taken by a Fahrenheit thermometer in a screen exposed to the open air.

This book might lead a tyro to suppose that correct time for obtaining errors and rating chronometers can only be obtained by equal altitudes of the sun, and only by a sextant of which the centring error is known; such is not the case. Time can be accurately obtained with a faulty sextant by observing sets of single altitudes both A.M. and P.M. of the sun, of stars both east and west of the meridian and meaning the results. By another less known but very valuable method the time is obtained in less than half an hour, if the stars are properly selected, by taking the equal altitudes of two different stars on opposite sides of the meridian.

Nothing must prevent the navigator from finding his position by stars. Take them at other times when possible, but *always* at twilight.

VANSITTART HOWARD.

Engine Tests and Boiler Efficiencies. By J. Buchetti. Pp. xv+255. (Westminster: Constable and Co., Ltd., 1903.) Price 10s. 6d. net.

THE volume before us is a translation, by Mr. Alexander Russell, of M. Buchetti's well-known work "Guide pour l'Essai des Moteurs." The object of the volume is to place before British and American engineers a record of Continental practice so as to render a comparison possible with home practice, and in order to further this comparison the measures and tables have been converted to English units.

The subject-matter is divided into nine chapters, and commences with well illustrated descriptions of the many indicators in use for testing steam and other engines. The important subject of mounting the indicator is then thoroughly dealt with, and this is as it should be, since the accuracy of the results depends entirely on the fitting and the scientific arrangement of the gear; M. Buchetti appears to have taken infinite pains to treat these details very thoroughly—there are many evidences of this right through the book.

The same can be said of the treatment of the several types of brakes now in use. When dealing with properties of steam, we note on p. 180 one or two clerical errors under the paragraph on saturated steam. The author talks about "If we compress the piston," &c., and further on in the next paragraph he says, "When the piston is allowed to expand"; surely the word piston should read "saturated steam" or "steam"?

The brief chapter on the testing of steam turbines by the Hon. C. A. Parsons, F.R.S., is all too short; we should have welcomed more interesting details from the pen of this able experimenter and engineer.

Taken as a whole, however, this book is full of interest. Students of steam and engineering should lose no time in obtaining a copy, since its contents are of the highest value to them.

N. J. L.

An English Grammar. By the Rev. S. Claude Tickell, A.K.C. Pp. 60. (London: O. Newmann and Co.) Price 2s.

THIS pamphlet of sixty pages is very unlike what is ordinarily understood by an English grammar. It opens with a paragraph of three lines headed "Analysis and Parsing Differentiated." Then comes

a fearfully intricate-looking table with the heading "(I.) Analysis by Triple Formula and Genealogy. (A) Analysis into Words." To the meaning of "triple formula" we find no clue but such as may be contained in the statement of the preface that "Analysis resolves itself into Limitation, Limiting Capacity, and Modification to denote Limiting Capacity." The table, which fills three pages, should, the author says, be learnt by heart. Further on there are two other similar tables, headed "(B) Analysis into Sentences and Clauses," and "(II.) Parsing." The "analysis into words" is exemplified by a number of specimens, in which the words forming the sentence are arranged in a diagram resembling a genealogical tree. The "analysis into sentences and clauses" is also performed by means of diagrams, but of a different kind. We must confess that the first impression we received on turning over the pages was one of utter bewilderment. After a while, however, we began to see that the author had a meaning, and for the most part a reasonable meaning, though his mode of presenting his ideas is not felicitous. Mr. Tickell seems to be one of those persons who have a talent and a passion for methodical classification, and an exaggerated estimate of its importance. We have no doubt that he has found the preparation of this little book a valuable help to the attaining of clear ideas on the structure of English sentences, but we should greatly pity any schoolboy who was condemned to learn his grammar from such a manual. On the other hand, we think it is possible that teachers may find in the book a good deal of useful suggestion.

The Chemistry of Plant and Animal Life. By Prof. H. Snyder, Professor of Agricultural Chemistry, University of Minnesota. Pp. xvii+406. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1903.) Price 6s. net.

THIS is a text-book of a type which is not very satisfactory from an educational point of view, as being written to supply the needs of a special class of students. It aims at supplying the chemistry, both pure and applied, which will be required by a class of mature students taking a college course in agricultural science. No preliminary knowledge of chemistry is assumed, and the preface indicates that the work is to be completed in a session of six months with one class-room or laboratory exercise each day. In consequence, the contents range from instructions for bending glass tubes to an account of such debatable matters as the relation of gliadin and glutenin to the quality of wheat flour. It would be hardly fair to call the treatment superficial, but clearly the object of the book is not so much to educate the student as to supply him with a certain amount of information about the scientific side of practical matters, and particularly to put him into a position to follow the current investigations of the experiment stations. Of course, the task is an impossible one; no ordinary student can acquire a real knowledge of pure and agricultural chemistry in six months, but given the special conditions, the book represents Prof. Snyder's abundant experience of trying to make the most use of the limited opportunity. The first 150 pages are devoted to ordinary inorganic chemistry, then about 100 pages deal with the proximate constituents of plants, followed by a section on the general course of development in the plant. Then come discussions of the composition of individual crops, and about eighty pages on digestion and the nutrition of animals. In the earlier part of the book a number of experiments are suggested, with a useful series of questions designed to make the student think out the object of each experiment.

NO. 1797, VOL. 69]

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

A New Mineral from Ceylon.

IN the beginning of February I bought from Mr. Holland 5 cwt. of the mineral described by Prof. Dunstan in last week's NATURE (p. 510). It crystallises in cubes, and the density is substantially that found by him. Mr. Tyrer, of the Stirling Chemical Works, Stratford, was so kind as to promise to work it up for me, and the process is still being carried on.

I had hoped to have positive and definite results to communicate before describing its constituents, but the publication by Prof. Dunstan of an analysis, and his statement that he is still engaged in its investigation, makes it necessary to write this letter.

The mineral, when heated alone, gives off 3.5 cubic centimetres of helium per gram; fused with hydrogen potassium sulphate, the amount is increased to 9.5 cubic centimetres. From this source I have already stored about 12 cubic feet of pure helium extracted in Mr. Tyrer's works.

It was at first believed that the mineral was rich in uranium, but different specimens contain only from 8 to 12 per cent. of that element, agreeing in this respect with the analyses published by Prof. Dunstan. Next, the other main constituent was believed to be zirconium, but the high density of the mineral rendered this improbable. An analyst of high standing, whose daily business it is to analyse minerals of this kind, returned 82 per cent. of zirconia as a constituent; the percentage of thorium was trifling—under 1 per cent. The mineral contains practically no thorium; this has been repeatedly confirmed in my laboratory. Nor does it contain any appreciable amount of cerium, lanthanum and didymium. The oxalate is almost completely soluble in excess of ammonium oxalate—a reaction which excludes thorium and the cerium group, but which points to zirconium. The equivalent of the elements of the oxalate group, which I at first took for zirconium, excludes the presence of any large quantity of zirconium, although that element is undoubtedly present. Fractionation shows that the oxalate precipitate (the portion soluble in ammonium oxalate) gives equivalents between 25.0 (the most insoluble portion of the double sulphate) and 44.7 (the most soluble portion); by far the major part of the element has the last mentioned equivalent. The separation of this portion is now being carried out with large quantities of material; several hundredweights are being worked up.

Assuming that the element is a tetrad, which is probable from its behaviour, it undoubtedly possesses an equivalent approaching the highest number (44.7), and for this there is a gap in the periodic table between cerium and thorium; one at least of the elements present (supposing that there is more than one present) will probably have an atomic weight of about 177, preceding tantalum (182.5) in the horizontal row of the periodic table.

I am at present engaged in mapping the spectrum of this new body or bodies.

As for the radio-activity, the mineral was bought in the hope that it would have a high content of radium. There is a trace of radium present, due, no doubt, to the spontaneous change of the uranium which the mineral contains. But the radio-activity due to this source is certainly not 5 per cent. of the total.

The period of decay of the emanation appears to point to the presence of a radio-active element closely resembling thorium X. The half value is 50 or 51 seconds, and while this is not quite the time for the decay of thorium emanation, it very nearly approaches it; at present the balance of evidence appears to point to the presence of an element closely resembling thorium, but not identical with it. The total radio-activity, moreover, is much greater than can be accounted for by the supposition that the one consists of pure thorium. Within the limits of a letter I am obliged to omit many more characteristics of this curious ore which have been ascertained, but I hope soon to be able to publish